91-00972 Oil pipeline performance review 99512.004

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CANADIAN PETROLEUM ASSOCIATION
PIPELINE DIVISION

OIL PIPELINE PERFORMANCE REVIEW

1987

91-00972/

CANADIAN PETROLEUM ASSOCIATION

PIPELINE DIVISION

OIL PIPELINE PERFORMANCE REVIEW

1987

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CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW

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1987 OIL PIPELINE PERFORMANCE REVIEW

EXECUTIVE SUMMARY

A. GENERAL OVERVIEW

- Failures per thousand kilometres of pipeline in service remain unchanged from 1986.
- Repair/cleanup costs were up 27% from the 1986 costs and down 26% from the previous 9 year average.

B. 1987 HIGHLIGHTS

(i) Performance

- In-service length of the systems reporting increased from 32 617 km in 1986 to 33 621 km in 1987.
- Deliveries increased approximately 5% to 230.5 x $10^6 m^3$ in 1987 compared to 1986.
- Traffic volume increased approximately 6% to 140 x $10^9 m^3$.km when compared to 1986.
- Operational errors dropped from 13 in 1986 to 8 in 1987.

(ii) Failures

- Forty-one (41) failures were reported.
- The average spill size in 1987 was 83% greater than the 1986 average and 67% of the previous 9 year average..
- There were three line pipe failures due to defective pipe in 1987.
- Spilled volume increased by approximately 94% to 3 977 m^3.
- Failures resulted in one injury, one fire and one explosion with fire.
- One incident accounted for one injury, explosion with fire and 70% of the total volume spilled.

CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW
SUMMARY OF FAILURES

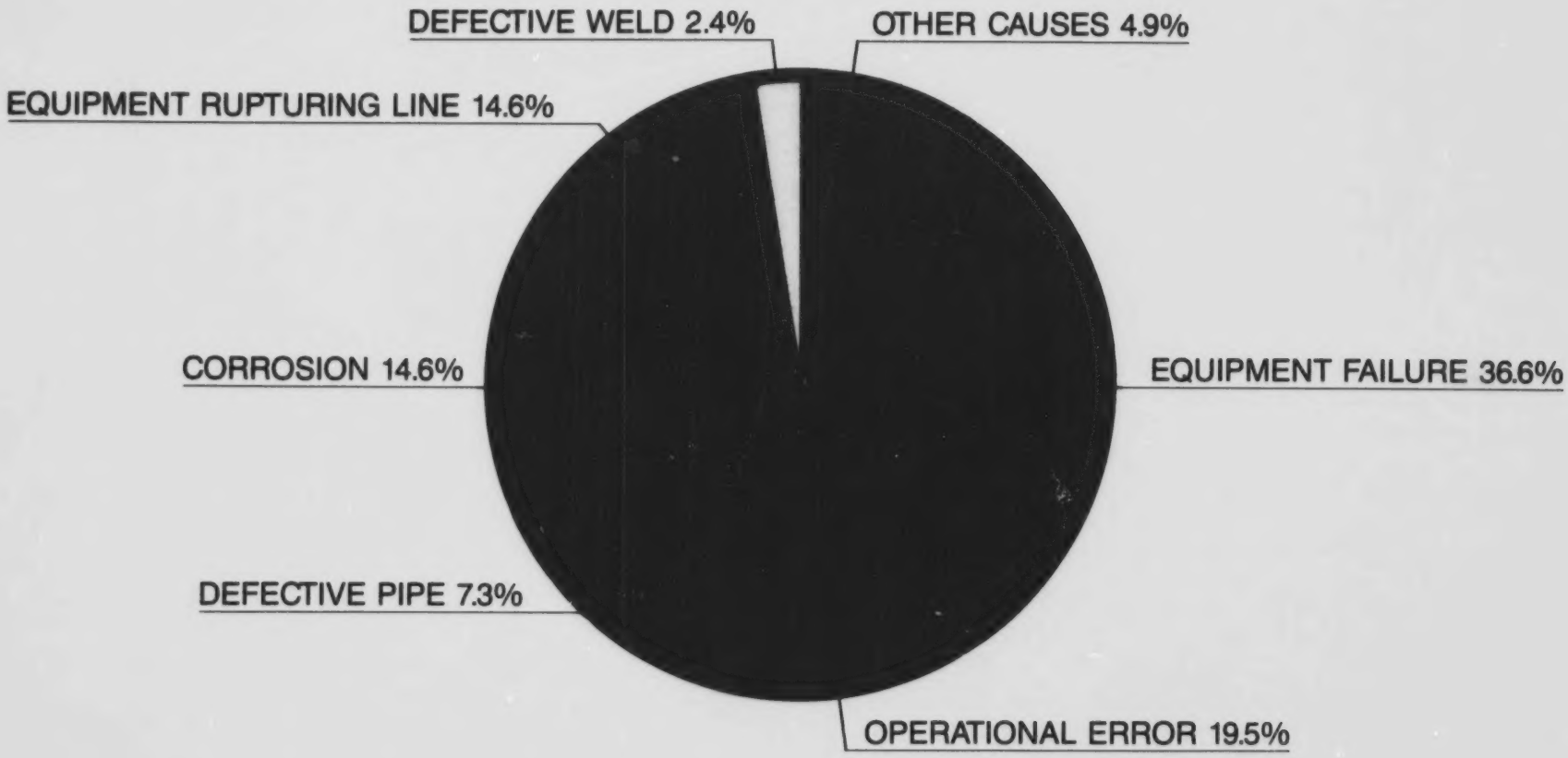
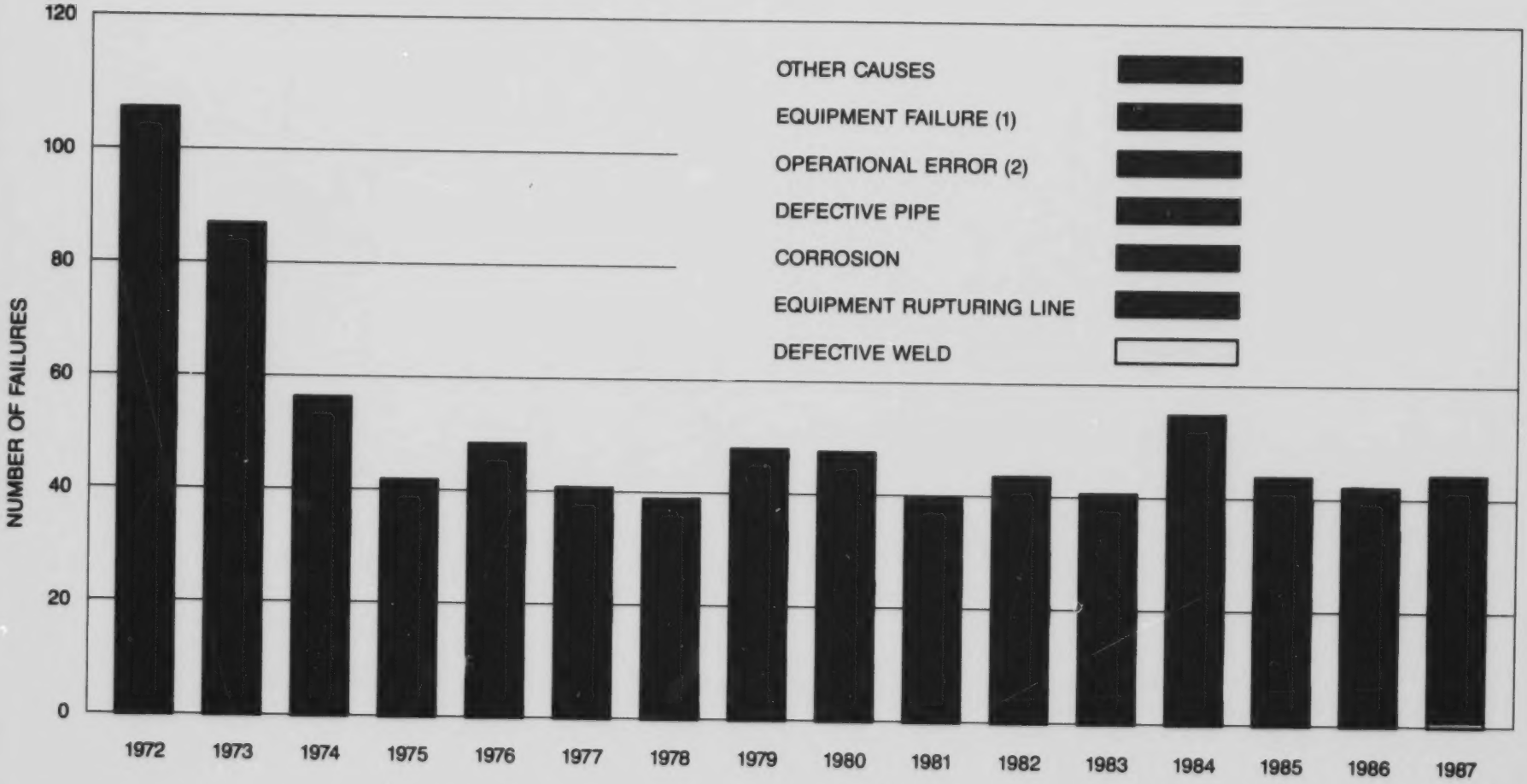


EXHIBIT 1.

CANADIAN PETROLEUM ASSOCIATION

1987 OIL PIPELINE PERFORMANCE REVIEW

HISTORICAL SUMMARY OF FAILURES



(1) NOTE: PRIOR TO 1977 INCLUDED IN OTHER CATEGORY

(2) NOTE: PRIOR TO 1976 INCLUDED IN OTHER CATEGORY

EXHIBIT 2

CANADIAN PETROLEUM ASSOCIATION

1987 OIL PIPELINE PERFORMANCE REVIEW

1.0 INTRODUCTION

All liquid hydrocarbon pipelines in Canada, including crude oil, refined products and High Vapour Pressure (HVP) lines are requested to participate in this industry analysis by submitting voluntary, confidential performance and failure reports. The majority of these pipeline systems are represented by the Canadian Petroleum Association (CPA).

Pipelines included in this review fall within the scope of CAN3-Z183-M86, Oil Pipeline Transportation Systems. However only oil lines and high vapour pressure pipelines downstream of production facilities and refined petroleum product lines are covered. Multi phase lines, producer operated pipelines and flow lines now included in CAN3-Z183-M86 are not covered. This scope is shown diagrammatically in Exhibit 3.

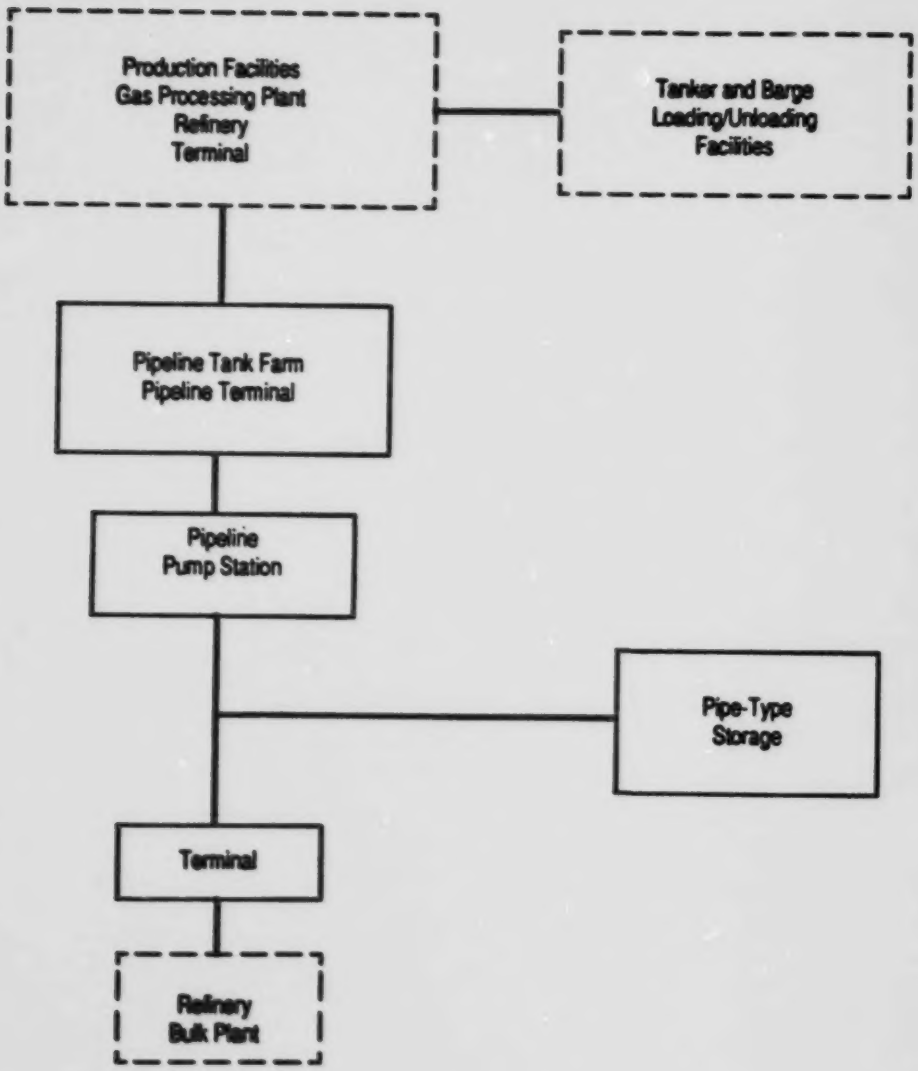
All data for the review was collected by CPA on two standard forms. Samples of the Oil Pipeline General Data Report and the Oil Pipeline Failure Report are included in Appendix B. Incidents resulting in a spill of 1.5 m^3 or more of oil, or any amount of HVP material, and any incident involving an injury, a death, a fire, or an explosion are classified as reportable.

Care must be exercised in any attempt to apply or compare statistics included in this review to any particular pipeline system or regulatory jurisdiction. They have been generated on the basis of submissions from a wide variety of pipelines, including gathering systems.

EXHIBIT 3

CANADIAN PETROLEUM ASSOCIATION

1987 OIL PIPELINE PERFORMANCE REVIEW
SCOPE



Note: Only facilities and pipelines indicated by solid lines are within scope of CPA - Oil Pipeline Performance Review.

2.0 PERFORMANCE REVIEW

Seventy participating Canadian oil pipeline systems submitted reports. This represents in excess of 90% of the industry and includes all major oil pipeline systems. The statistics in this review are, therefore, considered representative of the industry.

2.1 1987 SUMMARY

- One injury, two fires, one with an explosion.
- Three defective pipe failures.
- Six cases of equipment rupturing a line.
- The average spill was 97 m^3 in 1987 - 83% greater than the 1986, this can be attributed mainly to one spill.
- Six leaks were detected by leak detection systems.
- deliveries increased 5.3%.
- Failures due to operational error dropped from 13 in 1986 to 8 in 1987.

2.2 1987 VS 1986 HIGHLIGHTS

A comparison of key results:

	1987	1986	% Change
Pipeline Systems Reporting	70	70	-
Length of Line In-Service - km	33621	32617	+3.1
Delivery Volume x 10^6 m^3	230.5	219.0	+5.3
Traffic Volume x 10^9 m^3.km	140.0	132.6	+5.6
No. of Failures	41	39	+5.1
Volume spilled - m^3	3977	2055	+93.5
Repair/Clean-up Costs - k$	1005	794	+26.5

2.3 HISTORICAL REVIEW

A ten year statistical summary of oil pipeline performance data is presented in Exhibit 4.

Key observations and highlights are:

- Length of line in service, total delivery volume and total traffic volume were all up from the prior nine year average, however the number of incidents reported were below the previous nine year average.
- Repair and cleanup costs were up from the previous year; however, still well below the preceeding nine-year average.

EXHIBIT 4

CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW
STATISTICAL SUMMARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Number of Pipeline Systems Reporting	51	51	53	53	61	61	65	66	70	70
Length of Line in Service - km	30569	29678	29785	29650	30308	30439	30615	30905	32617	33621
Delivery Volume x 10^6 m^3	212.3	245.4	235.7	214.9	211.6	204.4	215.3	211.6	219.0	230.5
Traffic Volume x 10^9 m^3.km.*	129.2	144.8	138.5	122.6	123.1	128.7	134.1	135.0	132.6	140.0
Number of Failures	37	47	45	39	42	39	53	43	39	41
Failures per 10^3 km	1.2	1.6	1.5	1.3	1.4	1.3	1.7	1.4	1.20	1.2
Failures per 10^9 m^3.km.	0.29	0.32	0.33	0.33	0.34	0.30	0.39	0.32	0.29	0.29
Volume Spilled - m^3	4881	7014	8511	2377	6537	7450	6171	10738	2055	3977
Volume Lost - m^3	742	2614	5931	1427	3531	6038	2982	7830	654	3154
Average Spill Size - m^3	132	149	189	61	156	196	116	250	53	97
Largest Spill Size - m^3	2970	1987	6061	516	1365	1589	1994	3800	320	2800
Injuries Resulting From Failures	0	1	0	0	2	4	2	5	4	1
Deaths Resulting From Failures	0	0	0	0	0	1	0	2	0	0
Repair, Damage and Spill Clean-up Costs - k$ **	431	1611	1254	634	1320	2721	953	2533	794	1005

* Not all volumes move total system length.
** Does not include cost of oil lost due to failure.

3.0 FAILURE SUMMARY

3.1 HIGHLIGHTS

Eighteen of the seventy participating pipeline systems reported a total of forty-one (41) failures in 1987. Failures were distributed as follows:

Nine Systems	- 1 Failure
Five Systems	- 2 Failures
One System	- 3 Failures
One System	- 4 Failures
One System	- 6 Failures
One System	- 9 Failures

Exhibit 5 provides a summary of 1987 failure categories.

Exhibit 6 provides additional details for each failure category. There was an explosion with fire and one injury associated with a pipeline rupture, and a tank fire as a result of a suspected lightning strike.

Forty-nine percent of the failures were detected by pipeline employees, thirty-seven percent by outside parties and fourteen percent by surveilance and leak detection systems*.

* For the purpose of this report the definition of surveillance & leak detection systems includes material balance systems, and/or any other mechanical or electronic means which would detect the possibility of a leak and initiate a response.

3.2 1987 VS TEN YEAR AVERAGE

SUMMARY OF FAILURES*

	10 Year Average	1987
EQUIPMENT FAILURES	12	15
EQUIPMENT RUPTURING LINE	6	6
CORROSION	10	6
OPERATIONAL ERROR	7	8
DEFECTIVE PIPE	4	3
DEFECTIVE WELD	0	1
OTHER	4	2
TOTAL	43	41

* It should be noted that this summary table has been revised to compare the 1987 results to a ten year average (1977-1986). Previous reports compared the year under review to the prior year (ie. 1986 vs 1985).

EXHIBIT 5

CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW
LIST OF FAILURES BY CATEGORY

EQUIPMENT FAILURES		
Gasket Failure	5	
Fittings	2	
Packing	1	
Pump Seals	4	
Valve Logic	1	
Expansion Joint	1	
Valve Bonnet	1	
	15	15
EQUIPMENT RUPTURING LINE		
Contract Equipment	6	
	6	6
CORROSION		
External	4	
Internal	2	
	6	6
OPERATIONAL ERROR		
Valve not Closed	2	
Overfilling	1	
Valve not Opened	4	
Safety Equipment not Installed	1	
	8	8
OTHER		
Damaged grease nipple	1	
Lightning	1	
	2	2
DEFECTIVE PIPE		
Seam Weld	3	
	3	3
DEFECTIVE WELD		
Fillet Weld	1	
	1	1
TOTAL		41

EXHIBIT 6

CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW
FAILURE STATISTICS

	EQUIPMENT FAILURE	EQUIPMENT RUPTURING LINE	CORROSION EXTERNAL	CORROSION INTERNAL	DEFECTIVE PIPE	DEFECTIVE WELDS	OPERATIONAL ERROR	OTHER CAUSES	TOTAL
NUMBER OF FAILURES	15	6	4	2	3	1	8	2	41
FAILURE LOCATION									
- LINE PIPE	1	4	4	0	1	1	0	1	12
- PUMP STATION	9	-	-	-	-	-	2	-	11
- TANK FARM	1	-	-	2	2	-	2	1	8
- DELIVERY POINT	4	2	-	-	-	-	4	-	10
DETECTION METHOD									
- OUTSIDE PARTY	6	3	1	-	-	-	3	1	14
- PIPELINE EMPLOYEE	7	2	3	2	1	-	5	1	21
- R.O.W. SURVEILLANCE	-	-	-	-	-	-	-	-	0
- LEAK DETECTION SYSTEM	2	1	-	-	2	1	-	-	6
FAILURE IMPACT									
- INJURIES	-	-	-	-	1	-	-	-	1
- FIRES	-	-	-	-	1	-	-	1	2
- EXPLOSIONS	-	-	-	-	1	-	-	-	1
- AREA DAMAGED (HECTARES)	5.0	0.4	1.8	0	24.5	0.3	-	0.4	32.4
- COSTS (k$)	189	139	62	15	383	71	25	121	1005
- CLEAN-UP TIME (DAYS)	34	15	3	6	16	10	15	24	123
- SHUTDOWN TIME (DAYS)	4.5	6.5	0.3	0.4	2.2	2.3	1.8	1.2	19.2
SPILL VOLUME (m^3)									
- RELEASED	227	271	250	50	2910	124	138	7	3977
- LOST	125	103	26	2	2806	39	53	1	3155
- RECLAIMED	97	162	224	48	105	60	31	3	730
- DISPOSED	6	6	0	0	0	25	54	3	94
COMMODITY RELEASED									
- CRUDE OIL	8	3	3	2	2	1	4	2	25
- CONDENSATE	1	1	-	-	-	2	-	-	4
- REFINED PRODUCTS	2	2	1	-	-	-	-	-	5
- HVP	4	0	-	-	1	2	-	-	7

APPENDIX A

CANADIAN PETROLEUM ASSOCIATION

1987 OIL PIPELINE PERFORMANCE REVIEW

FAILURE DETAILS

Failures have been arranged into 6 categories as indicated in Exhibits 4, 5 and 6. Details of each failure category are as follows:

1. EQUIPMENT FAILURE

This category accounted for fifteen (37%) of the failures in 1987. There were no injuries, fires, or explosions associated with these failures. Of the 227 m^3 released about 125 m^3 was lost.

The failure of pump seals and packing glands accounted for five failures, while leaking gaskets caused five others.

One incident was responsible for 55% of the liquid released in this category.

The two most significant failures are highlighted as follows:

(i) An expansion joint failed releasing 125 m^3 of condensate. The product escaped through an open dyke drain valve and entered a creek with 102 m^3 lost.

(ii) A pump seal failed releasing 50 m^3 of gasoline. A concurrent failure of the drain piping resulted in 7 m^3 lost.

2. EQUIPMENT RUPTURING LINE

There were six failures in this category in 1987.

Three failures occured as a result of excavations by landowners without advising the pipeline operators. These failures resulted in the release of 89 m^3 of gasoline, 78 m^3 of crude oil and 55 m^3 of condensate, which represented 82% of the volume released in this category.

Two failures were a result of construction activities within the limits of oil field batteries, without the knowledge of the pipeline operator. A total of 24 m^3 of crude oil was released, of which all but 3 m^3 was recovered.

An improper procedure used to expose a pipeline for a crossing, resulted in the rupture of a gasoline pipeline. 22 m^3 of the 25 m^3 released was recovered.

3. CORROSION

EXTERNAL

There were four cases of external corrosion. Three of these corrosion leaks were a result of outside electrical interference which in turn caused the pipeline to act as a sacrificial anode. A total of 250 m^3 of crude oil was released with 23 m^3 lost.

INTERNAL

Internal corrosion accounted for two failures. A total of 50 m^3 of crude oil was released which is significantly less than in 1986.

Both leaks occurred as a result of internal corrosion of tank manifold lines. 48 m^3 of oil were recovered.

There were a total of 6 internal and external corrosion failures for 1987.

4. OPERATIONAL ERROR

There were eight incidents of operational error that resulted in the release of 138 m^3 (53 m^3 lost).

(i) Two incidents of valves not being closed resulted in the release of 73 m^3 (1 m^3 lost).

(ii) There was one incident of tanks being over filled. A total of 2.6 m^3 was released (1 m^3 lost).

(iii) Four incidents of valves not being open resulted in 22 m^3 of hydrocarbon being released, of which 11.5 m^3 were recovered.

(iv) 40 m^3 of NGL were lost as a result of piping being over pressured where a thermal relief valve had been previously removed.

5. DEFECTIVE PIPE

Defective pipe resulted in three failures releasing 2910 m^3 of hydrocarbon, 73% of all material released in 1987.

The most significant incident was a defective seam weld failure which released 2800 m^3 of NGL and resulted in an explosion, a fire and an injury. The other two leaks in this category were also seam weld failures.

6. DEFECTIVE WELD

A defective fillet weld caused a failure that resulted in 124m^3 of crude being released. The cause of the failure was determined to be fatigue cracking at the toe of a fillet weld attaching a 114.3mm nipple to a 219.1mm reinforcing saddle.

7. OTHER

There were two incidents in this category;

(i) A tank rim fire resulting from a lightning strike was extinguished without injury or a release of oil.

(ii) A leaking grease nipple on a buried valve released 7m^3 of crude (1m^3 lost). It was suspected that the nipple had been damaged during the construction of the pipeline some 3 years earlier.

APPENDIX B

OIL PIPELINE GENERAL DATA REPORT

OIL PIPELINE FAILURE REPORT

OIL PIPELINE FAILURE REPORT

CANADIAN PETROLEUM ASSOCIATION

Sheet ..... of .....

PIPELINE COMPANY OR SYSTEM

Name: .....

Address: .....

.....

INSTRUCTIONS

1. This report is for pipeline systems covered by CSA Standard Z183 – Oil Pipeline Transportation Systems. All data on this form will be kept confidential in accordance with request in "USE OF DATA" section.
2. A separate report should be made out for each failure and forwarded CPA as soon as possible, but not later than 60 days after the failure.
3. A reportable failure is one in which 1.5 m^3 or more of oil are released; OR one in which any High Vapour Pressure (HVP) material is released; OR one in which there is an injury, a death, a fire, or an explosion. Failures during controlled testing, when using oil as the test medium, should be reported in accordance with these guidelines.
4. Zone location questions apply only to failures involving HVPs.
5. Reports by CPA member companies must be completed or reviewed for completeness by CPA Technical Committee or Pipeline Division Member.
6. Property damage Costs reported under Failure Impact will be reported excluding product loss.

NOTE

Please complete all appropriate sections including "WRITTEN ACCOUNT OF FAILURE" using Typewriter or Black Ink.

GENERAL INFORMATION

Date of Failure

Year	Month	Day	Time (24 h)
			:

Commodity Released

Volume Information – Cubic Metres

Released		Recovered		Lost
	-		+	

Recovered		Reclaimed		Disposed
	-		+	

Province: .....

Nearest Town: .....

Area Type: ☐ Urban ☐ Rural

Spill was on: ☐ Land ☐ Water

Terrain Type: .....

Zone Location if applicable: ☐ Zone 1 ☐ Zone 2

Installation Year of Failed Component: 1 9 _ _

☐ Line Pipe ☐ Pump Station ☐ Tank Farm ☐ Delivery Point

MAJOR CAUSE OF FAILURE

Please Check One Only:

☐ Internal Corrosion ☐ Defective Pipe ☐ Equipment Rupturing Line
☐ External Corrosion ☐ Defective Weld ☐ Pipe Previously Damaged
☐ Operational Error ☐ Equipment Failure ☐ Natural Hazard
☐ Other (Specify): .....

ORIGIN OF SPILL

Please Check One Only:

☐ Pipe ☐ Scraper Trap ☐ Valve ☐ Meter
☐ Seam Weld ☐ Welded Fitting ☐ Pump ☐ Prover
☐ Girth Weld ☐ Bolted Fitting ☐ Tank ☐ Strainer
☐ Other (Specify): .....

DETECTION OF SPILL

☐ Outside Party ☐ Pipeline Employee ☐ Leak Detection System

Leak Detection System is: ☐ Manual ☐ Transient Model ☐ Volume Balance

Was the leak detectable within the Leak Detection System ☐ Yes ☐ No

Describe .....

.....

Time from Failure to Detection of Failure ..... hrs. ..... min.

FAILURE IMPACT

Number of Injuries		Number of Deaths		Fire	Explosion	Area Damaged (hectares)	
Employees	Others	Employees	Others	☐ Yes ☐ No	☐ Yes ☐ No	Pipeline	Others

Clean-up Costs	Property Damage Costs		Clean-up Time	Duration of System Shutdown	
	Pipeline	Others			
$	$	$	Days	Days	Hours

IF FAILURE OCCURRED IN PIPE

Pipe Diameter	Pipe Wall Thickness	Specification and Grade	Type of Seam Weld	Type of Girth Weld	Metallurgical Report Done?
mm	mm				☐ Yes ☐ No

Depth of Cover if Below Ground	Configuration at Point of Failure	Type of Coating	Condition of Coating	Size of Failure (Major Dimension)
cm	☐ Straight ☐ Sag Bend ☐ Side Bend ☐ Overbend			mm

Allowable Operating Pressure	Pressure at Time and Location of Failure	Date of Last Pressure Test			Distance to Nearest Valve		Evidence of Brittle Fracture?	Flowrate at Time of Failure
		Y	M	D	Upstream	Downstream		
kPa	kPa				km	km	☐ Yes ☐ No	m^3/h

IF CORROSION

☐ Internal ☐ External	If Internal, was Inhibitor Used?	If External, was System under Cathodic Protection?	Type of Cathodic Protection	Appearance of Failed Facilty
	☐ Yes ☐ No	☐ Yes ☐ No		

IF EQUIPMENT RUPTURING LINE

Type of Equipment and Activity Causing Failure	Was Equipment Operator Aware of Pipeline? How?	Was Pipeline Aware of Equipment Activity? How?	Was One-Call System in Operation?
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Frequency and Type of ROW Surveillance at Failure Location	Did Failure Occur at Time of Damage	If Previous Damage, How Long between Damage and Failure?	Distance to Nearest Warning Sign
	☐ Yes ☐ No		m

WRITTEN ACCOUNT OF FAILURE

Include a brief written account of the failure with any special details, recommendations that may prevent similar failures, or information that may assist Standard and Code writing bodies. (Other written reports of the failure may be attached.)

USE OF DATA

Please Check One Only:

☐ Data on this form must be restricted to use by CPA only.

☐ Data on this form may be reviewed by CSA Z-183 Technical Committee.

REPORTED BY

Name: Date Completed:

Title: Telephone No.:

CPA * MEMBER

Name: Date Checked:

* If applicable.

MAIL TO: Canadian Petroleum Association – Pipeline Division;
3800, 150 - 6th Avenue S.W., Calgary, Alberta T2P 3Y7

80 01

OIL PIPELINE GENERAL DATA REPORT

CANADIAN PETROLEUM ASSOCIATION

Sheet ..... of .....

YEAR 19

PIPELINE COMPANY OR SYSTEM

Name: .....

Address: .....

.....

INSTRUCTIONS

1. This report is for clean oil onshore pipeline systems covered by CSA Standard Z183 – Oil Pipeline Transportation Systems.
2. A separate report should be made for each operating pipeline system and forwarded to CPA within 30 days of each year end.
3. Zone Location questions apply only to systems handling High Vapour Pressure (HVP) material.
4. Reports by CPA member companies must be completed or reviewed for completeness by CPA Technical Committee or Pipeline Division member.

FAILURES

Number of Reportable Failures During Recording Calendar Year: (A failure report must be submitted for each reportable failure) .....

VOLUME DATA

Volume of Oil Transported During Year – LVP ..... m^3

– HVP ..... m^3

Volume – Distance during year – LVP ..... m^3 km

– HVP ..... m^3 km

CONSTRUCTION DATA

Pipeline Metrage at Various Depths of Cover:

Nominal Depth of Cover	Zone 1	Zone 2	Total System
Less than 75 cm	..... km	..... km	..... km
75 cm to 100 cm	..... km	..... km	..... km
101 cm to 125 cm	..... km	..... km	..... km
126 cm to 150 cm	..... km	..... km	..... km
Greater than 150 cm	..... km	..... km	..... km
Total System Metrage	..... km	..... km	..... km

PIPELINE SURVEILLANCE DATA

Pipeline Metrage Under Right-of-Way Surveillance:

Type of Surveillance	Zone	Metrage	Frequency
(a)	.....	..... km	.....
(b)	.....	..... km	.....
(c)	.....	..... km	.....
(d) No regular surveillance	.....	..... km	.....
Total System Metrage	.....	..... km	.....

Pipeline Metrage Under Leak Detection Surveillance:

Is the Pipeline system under ☐ manual ☐ automatic/computer leak detection surveillance. If Electronic or automatic provide details following:

Type of System	Zone 1	Zone 2
(a)	..... km	..... km
(b)	..... km	..... km
(c)	..... km	..... km
(d)	..... km	..... km

MAINLINE VALVE DATA

Mainline Valve or Check Valve Spacing:

Valve Spacing	Zone 1 Total Metrage	Zone 1 No. of Valves	Zone 2 Total Metrage	Zone 2 No. of Valves
Greater than 30 km	km		km	
21 km to 30 km	km		km	
11 km to 20 km	km		km	
5 km to 10 km	km		km	
Less than 5 km	km		km	
Total Metrage	km		km	

Number of Valves with Remote Operation: Zone 1 Zone 2

PIPE DATA

Include all specifications requested below for pipe sections of 1.0 km or more. For sections less than 1.0 km include specifications in totals for similar size pipe.

Zone	Outside Diameter	Wall Thickness	Length	Grade	Seam Type
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		
	mm	mm	km		

Use Additional Data Reports as Required.

GENERAL SYSTEM DATA

	Length (km)	Number of Stations	Number of Pumps	Installed Power (kW)	Storage (M^3)
Mainline					
Gathering					
Total					

Total number of full time employees: .....

REPORTED BY

Name: ..... Date Completed: .....

Title: ..... Telephone No.: .....

CPA • MEMBER

Name: ..... Date Checked: .....

• If applicable.

MAIL TO: Canadian Petroleum Association – Pipeline Division;
3800, 150 - 6th Avenue S.W., Calgary, Alberta T2P 3Y7

APPENDIX C

1987 OIL PIPELINE PERFORMANCE REVIEW

PARTICIPATING PIPELINES

CANADIAN PETROLEUM ASSOCIATION
1987 OIL PIPELINE PERFORMANCE REVIEW
PARTICIPATING PIPELINE OPERATORS AND COMPANIES

Alberta Energy Co. Ltd.
- Alberta Oil Sands Pipeline
- Cold Lake Bitumen Blend & Diluent Line
- Cold Lake Condensate Line
- Redwater Pipeline

B.P. Resources Canada Limited
- Chauvin/Hardisty
- Red Earth System

Dome Petroleum Limited
- Alberta Ethane Gathering System Ltd.
- Aurora Pipe Line Company
- Cochin Pipe Lines Limited
- Dome Amoco Cochrane - Edmonton Pipeline
- Empress - Kerrobert Pipeline
- Rangeland Pipe Line Company
- NGL Pipeline Ltd. (EDS North) NR

Esso Petroleum Canada
- Quebec South Shore Pipe Line
- Sarnia Products Pipe Line
- Winnipeg Pipeline Company Limited

Esso Petroleum Canada - Imperial Pipeline Company Limited
- Excelsior/Fairydell Crude System
- Leduc Crude System
- Acheson/Golden Spike System
- Redwater Propane System
- Alberta Butane System
- Edmonton-Sundre Crude Line
- Judy Creek Condensate PipeLine
- Nisku Products Pipeline Company Limited
- Kamloops Tie-in NL

Gulf Canada Corporation
- Gulf Alberta Pipe Line
- Valley Pipe Line
- Rimbey Pipeline Co. Ltd.
- Fort Saskatchewan Pipeline
- Wabasca River Pipeline NL

Home Oil Company Limited
- Cremona Pipe Line Division
- Federated Crude System
- Federated NGL System
- Manyberries Pipe Line

Husky Oil Operations Ltd.

Interprovincial Pipe Line Limited
Interprovincial Pipe Line Limited (NW)

Mobil Oil Canada Ltd.
- Rainbow Pipe Line Company Ltd.
- South Saskatchewan Pipe Line Company

Montreal Pipe Line Limited

Murphy Oil Company Ltd.
- Cactus Lake Pipeline
- Milk River Pipeline
- Wascana Pipeline Ltd.
- Manito Pipelines Ltd.

Norcen Energy Resources Ltd.
- Virden
- Fort St. John
- Joarcam
- Golden
- Weyburn

Peace Pipe Line Ltd.

Pembina Resources Limited

Petro Canada Products
- Stony Beach Pipeline
- Saskatoon Pipe Line
- Alberta Products Pipe Line Ltd.

Petro Canada Resources
- Petroleum Transmission Company

Petromont Inc. (Shawinigan P.L.)

Producers Pipeline Inc.
- Producers/Westspur Pipeline

Sun-Canadian Pipe Line Company Limited

Sun Pipe Line Company

Suncor Inc.
- Blueberry Taylor Pipeline
- Ft. McMurray to Edmonton Oil Pipeline

Texaco Canada Resources Ltd.
- Rimbey to Edmonton System
- Bonnie Glen System
- Bonnie Glen to West Pembina
- A.E.G.S. to Bonnie Glen
- Green River System

Trans Mountain Pipe Line Company Ltd.

Trans-Northern Pipelines Inc.

Unocal Canada Limited

Westcoast Petroleum Ltd.

Note: NR: New Report NL: New Line